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मानक

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IS 2771-2 (1975): Fibreboard Boxes, Part II: Solid Fibreboard Boxes [CHD 15: Paper and its products]



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“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard
SPECIFICATION FOR
FIBREBOARD BOXES

PART II SOLID FIBREBOARD BOXES

(First Revision)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

AMENDMENT NO. 1 FEBRUARY 1998
TO
IS 2771 (Part 2) : 1975 SPECIFICATION FOR
FIBREBOARD BOXES
PART 2 SOLID FIBREBOARD BOXES
(First Revision)

(Page 3, clause 0.3.1) — Insert the following after 0.3.1 and renumber the subsequent clause:

‘0.4 A scheme for labelling environment friendly products to be known as ECO Mark has been introduced at the instance of the Ministry of Environment and Forests (MEF). The ECO Mark shall be administered by the Bureau of Indian Standards (BIS) under the *BIS Act*, 1986 as per the Resolution No. 71 dated 20 February 1991, published in the Gazette of the Government of India. For a product to be eligible for ECO Mark it shall also carry Standard Mark of BIS for quality, in addition to the compliance with the optional environment friendly (EF) requirements. For this purpose, the Standard Mark of BIS would be a single mark being a combination of the ISI Mark and the ECO logo. Requirements to be satisfied for a product to qualify for the BIS Standard Mark for ECO friendliness, will be included in the relevant published Indian Standard through an amendment. These requirements will be optional; manufacturing units will be free to opt for the ISI Mark alone also.

This amendment is based on the Gazette Notification No. 364 dated 7 September 1995 for packaging material/package (Part I Paper Board and Plastics Excluding Laminates) as environment friendly products, published in the Gazette of India. This amendment is, therefore, being issued to this standard to include EF requirements for solid fibreboard boxes.’

(Page 5, clause 7.5) — Insert the following new clauses after 7.5 and renumber the subsequent clauses:

‘8 ADDITIONAL REQUIREMENTS FOR ECO MARK

Amend No. 1 to IS 2771 (Part 2) : 1975

8.1 General Requirements

8.1.1 The product shall conform to the requirements for quality and performance prescribed under 3 to 7.

8.1.2 The manufacturer shall produce to BIS, the environmental consent clearance from the concerned State Pollution Control Board as per the provisions of *Water (Prevention and Control of Pollution) Act, 1974* and *Air (Prevention and Control of Pollution) Act, 1981* along with the authorization, if required under the *Environment (Protection) Act, 1986* and the Rules made thereunder, while applying for ECO Mark. Additionally the manufacturers shall also comply with the provisions under *Prevention of Food Adulteration Act, 1954* and the Rules made thereunder wherever necessary.

8.2 Specific Requirements

8.2.1 The material shall be of the following two types depending on the raw material used in the manufacture:

- a) *Type A* — Manufactured from pulp containing not less than 60 percent by mass of pulp made from materials other than bamboo, hardwood, softwood and reed.
- b) *Type B* — Manufactured from pulp made from 100 percent waste paper or agricultural/industrial waste.

8.2.2 The material if used for the packaging of food materials, shall be manufactured from virgin pulp and shall be free from dioxins. Printed surfaces of the paper shall not come into contact with the food and the maximum amounts of contaminants in paper intended to come into contact with food shall not exceed the limits prescribed in Table 3 when tested according to the methods given in Annex A.

8.3 Additional Requirements for Packaging and Marking

8.3.1 For ECO Mark, solid fibreboard boxes shall be packed in such packages which shall be recyclable/reusable or biodegradable.

8.3.2 The solid fibreboard boxes may display in brief the criteria based on which the product has been labelled as environment friendly.

Table 3 Limits of Contaminants in Paper
(Clause 8.2.2)

Contaminant	Paper Intended to Come into Contact with Dry Food	Paper Intended to Come into Contact with Wet Food and Food with Fatty Surface	Paper for Filtration
	(mg/kg of paper)	(mg/kg of paper)	(mg/kg of paper)
Cadmium (Cd)	—	0.5	0.5
Chromium (Cr ⁶⁺)	—	0.1	0.1
Lead (Pb)	—	3.0	3.0
Mercury (Hg)	—	0.3	0.3
Pentachlorophenol (PCP)	0.05	0.05	0.05
Polychlorinated biphenyls (PCBs)	2.0	2.0	0.5

8.3.3 The solid fibreboard boxes may be sold along with instruction for proper use and mode of safe disposal so as to maximise its performance and minimise wastage.

8.3.4 It shall be suitably marked on solid fibreboard boxes that ECO Mark label is applicable only to the packaging material/package if content is not separately covered under the ECO Mark scheme.

NOTE — It may be stated that the ECO Mark is applicable to the product or packaging material or both.

[Page 7, clause 10.2.1 (renumbered)] — Insert the following after 10.2.1 (renumbered):

ANNEX A

(Clause 8.2.2)

DETERMINATION OF CHROMIUM, LEAD, MERCURY, CADMIUM, PENTACHLOROPHENOL AND POLYCHLORINATED BIPHENYLS

A-1 DETERMINATION OF CHROMIUM (as Cr⁶⁺)

A-1.1 Principle

The hexavalent chromium is determined colorimetrically by reaction with diphenylcarbazide in acid solution at a wavelength of 550 nm.

Amend No. 1 to IS 2771 (Part 2) : 1975

A-1.2 Apparatus

A-1.2.1 Spectrophotometer

Any spectrophotometer suitable for measurement at a wavelength of about 550 nm or photoelectric absorptiometer fitted with filters giving maximum transmission near 550 nm.

A-1.2.2 Shaker

Any shaker suitable for rotating/moving at 30 ± 2 rev/min.

A-1.3 Reagents

A-1.3.1 Extraction Fluid — Mix 5.7 ml of acetic acid in distilled water.

A-1.3.2 Nitric Acid — Concentrated.

A-1.3.3 Sulphuric Acid — Approximately 0.2 N.

A-1.3.4 Diphenylcarbazide Solution

Dissolve 0.25 g of diphenylcarbazide in 50 ml acetone. Store in a brown bottle. Discard when solution becomes discoloured.

A-1.3.5 Stock Chromium Solution

Dissolve 0.141 g $K_2Cr_2O_7$ in distilled water and dilute to 100 ml. One millilitre of this solution contains 500 μ g of chromium (as Cr^{6+}).

A-1.3.6 Intermediate Chromium Solution

Take 10 ml of stock chromium solution and dilute to 1 000 ml with distilled water. One millilitre of this solution contains 5.00 μ g of chromium (as Cr^{6+}).

A-1.3.7 Standard Chromium Solution

Take 10 ml of intermediate chromium solution and dilute to 1000 ml with distilled water. One millilitre of this solution contains 0.05 μ g of chromium (as Cr^{6+}).

A-1.3.8 Indicator Paper — Covering the pH range 0.5 to 1.5.

A-1.4 Procedure

A-1.4.1 Preparation of Calibration Curve

Into each of a series of ten 250-ml volumetric flasks, place the quantities of standard chromium solution as indicated below:

<i>Standard Chromium Solution</i>	<i>Corresponding to Cr⁶⁺</i>
ml	µg
1.0	0.05
2.0	0.10
3.0	0.15
4.0	0.20
5.0	0.25
6.0	0.30
7.0	0.35
8.0	0.40
9.0	0.45
10.0	0.50

A-1.4.1.1 Add sulphuric acid to adjust the solution pH to 1.0 ± 0.3 in each flask and dilute to 100 ml. Add 2.0 ml diphenylcarbazide solution, mix thoroughly and wait for 10 minutes.

A-1.4.1.2 Carry out the measurement on the spectrophotometer or on a photoelectric colorimeter using appropriate filter with a 1-cm cell at a wavelength of 550 nm. As references use extraction fluid. Correct the absorbance readings of standard solution by subtracting absorbance of a reagent blank carried through the above method.

A-1.4.1.3 Construct a calibration curve by plotting corrected absorbance values against chromium content in microgram per 102 ml.

A-1.4.2 Determination

A-1.4.2.1 Sample preparation

Tear the air dry sample into pieces of suitable size. Do not use cut or punched edges or other parts where metallic contamination may have occurred.

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A-1.4.2.2 Preparation of test solution

Weigh to the nearest 0.01 g about 20 g of paper, leach the paper with about 200 ml of extraction fluid for 18 ± 2 h using shaker rotating/moving at 30 ± 2 rev/min. Filter the extract through glass fibre filter with 0.45 micron pore size. Add sufficient amount of aluminium sulphate and filter if any precipitate appears. Transfer the solution quantitatively to a volumetric flask of suitable capacity, dilute to the mark and mix.

A-1.4.2.3 According to the expected chromium content, take an aliquot portion of the test solution containing 10 to 100 μg of chromium to a 100-ml volumetric flask. Adjust the pH of the solution to 1.0 ± 0.3 by adding 0.2 N sulphuric acid. Dilute to 100 ml. Add 2 ml diphenylcarbazide solution, mix thoroughly, and wait for 10 minutes.

A-1.4.2.4 Photometric measurement

Carry out the photometric measurements of the test solution according to the methods given in A-1.4.1.1.

A-1.4.3 Calculation

By means of the calibration curve (see A-1.4.1.3) determine the quantity of chromium present:

$$\text{Chromium (as Cr}^{6+}\text{), ppm} = \frac{m \times D}{M}$$

where

m = mass of chromium determined in the aliquot of the sample solution, μg ;

D = ratio of the volume of test solution to the volume of aliquot portion taken for the colour development; and

M = mass of paper sample taken for testing, g.

A-2 DETERMINATION OF MERCURY (as Hg)

A-2.1 Principle

The flameless atomic absorption procedure is a physical method based on the absorption of radiation at 253.7 nm by mercury vapour. The mercury is reduced

to the elemental state and aerated from solution in a closed system. The mercury vapour passes through a cell positioned in the light path of mercury hollow cathode lamp of an atomic absorption spectrophotometer. Absorbance (peak height) is measured as a function of mercury concentration and record.

A-2.2 Apparatus

A-2.2.1 Atomic Absorption Spectrometer (AAS) and Associated Equipment

Instrument settings recommended by the manufacturer shall be followed. Instruments designed specifically for the measurement of mercury using the cold vapour technique may be substituted for the AAS.

A-2.2.2 Mercury Vapour Generation Assembly

Consists of an absorption cell, peristaltic pump, flow meter, aeration tubing and a drying tube containing magnesium perchlorate.

A-2.2.3 Mercury Hollow Cathode Lamp

A-2.2.4 Recorder/Printer/Display Meter

Any multi-range variable recorder that is compatible with the UV detection system is suitable.

A-2.3 Reagents

A-2.3.1 Sulphuric Acid — Concentrated.

A-2.3.2 Nitric Acid — Concentrated.

A-2.3.3 Stannous Chloride Solution

Dissolve 25 g of stannous chloride (SnCl_2) in water containing 50 ml of concentrated hydrochloric acid and dilute to 250 ml. If a suspension forms, stir reagent continuously during use.

A-2.3.4 Sodium Chloride — Hydroxylamine Sulphate Solution

Dissolve 12 g of sodium chloride and 12 g of hydroxylamine sulphate (NH_2OH)₂ H_2SO_4 in distilled water and dilute to 100 ml.

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A-2.3.5 Potassium Permanganate Solution

Dissolve 5 g of potassium permanganate in distilled water and dilute to 100 ml.

A-2.3.6 Potassium Persulphate Solution

Dissolve 5 g of potassium persulphate in distilled water and dilute to 100 ml.

A-2.3.7 Stock Mercury Solution

Dissolve 1.354 g of mercuric chloride in about 700 ml of distilled water. Add 10 ml of concentrated nitric acid and make up to 1 000 ml. One millilitre of the solution contains 1 mg of mercury as Hg.

A-2.3.8 Standard Mercury Solution

Prepare a series of standard mercury solutions containing 0 to 5 µg/l by appropriate dilution of stock mercury solution (A-2.3.7) with water containing 10 ml of concentrated nitric acid per litre. Prepare standards daily.

NOTE — Use mercury free distilled water for the preparation of reagents and standards.

A-2.4 Procedure

A-2.4.1 Instrument Operation

Follow the procedure of the manufacturer's operating manual. Connect the mercury vapour generating assembly as shown in Fig. 1.

A-2.4.2 Standardization

Transfer 100 ml of each of the 1.0, 2.0 and 5.0 µg/l standard mercury solution and a blank of 100 ml water to 300 ml BOD bottles. Add 5 ml of concentrated sulphuric acid and 2.5 ml of concentrated nitric acid to each bottle. Add 15 ml of potassium permanganate solution to each bottle and let stand for at least 15 minutes. Add 8 ml of potassium persulphate ($K_2S_2O_8$) solution to each bottle and heat for 2 hours in a water bath at 95°C. Cool and add 6 ml of sodium chloride-hydroxylamine sulphate solution to reduce the excess permanganate. After decolourization add 5 ml of stannous chloride solution and attach the bottle immediately to the aeration apparatus forming a closed system. As mercury is volatilised and carried into the absorption cell, absorbance will increase to a maximum within a few seconds. As soon as recorder returns

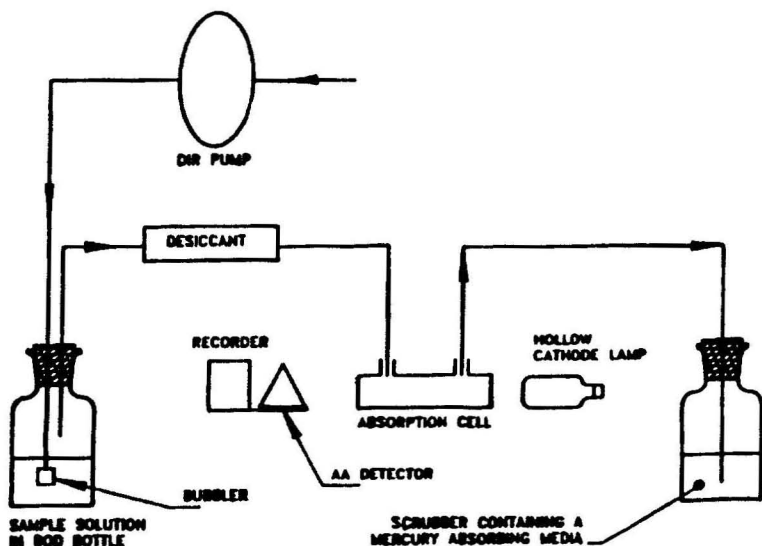


FIG. 1 SCHEMATIC ARRANGEMENT OF EQUIPMENT FOR MEASUREMENT OF MERCURY BY COLD VAPOUR ATOMIC ABSORPTION TECHNIQUE

approximately to the base line, remove stopper holding the aeration frit from the reaction bottle and replace with a bottle containing distilled water. Flush the system for a few seconds and run the next standard in the same manner. Construct a standard calibration curve by plotting absorbance (peak height) versus mercury concentration in μg .

A-2.4.3 Determination

A-2.4.3.1 Sample preparation

Tear the air dry sample into pieces of suitable size. Do not use cut or punched edges or other parts where metallic contamination may have occurred.

A-2.4.3.2 Preparation of test solution

Weigh to the nearest 0.01 g about 20 g of paper, leach the paper with about 200 ml of extraction fluid for 18 ± 2 h using shaker rotating/moving at 30 ± 2 rev/min.

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Filter the extract through glass fibre filter with 0.45 micron pore size. Transfer the solution quantitatively to a volumetric flask of suitable capacity, dilute to the mark and mix.

A-2.4.3.3 According to the expected mercury content, take an aliquot portion of the test solution containing not more than 5 µg/l of mercury to a 300 ml BOD bottle and treat as in A-2.4.2.

A-2.5 Calculation

Determine peak height of sample from recorder chart, read mercury value from standard curve and determine the mercury content of the sample using the following formula:

$$\text{Mercury (as Hg), ppm} = \frac{C \times V}{M \times 1\,000}$$

where

C = concentration of mercury from the calibration curve;

V = volume of test solution prepared, ml; and

M = mass of paper sample taken for testing, g.

A-3 DETERMINATION OF LEAD (as Pb)

A-3.1 Principle

The lead content of the sample is determined by electrothermal atomic absorption spectrometric method.

A-3.2 Apparatus

A-3.2.1 Atomic Absorption Spectrometer — with graphite oven technique in place of conventional burner assembly.

A-3.2.2 Lead Hollow-Cathode Lamp or Multielement Hollow-Cathode Lamp — For use at 283.3 nm.

A-3.2.3 Hot Plate

A-3.3 Reagents

A-3.3.1 Nitric Acid — concentrated.

A-3.3.2 Nitric Acid — 1:1.

A-3.3.3 Dilute Nitric Acid — 1:499.

A-3.3.4 Stock Lead Solution

Dissolve 1.599 9 g of $\text{Pb}(\text{NO}_3)_2$ in a mixture of 10 ml of concentrated HNO_3 and 100 ml of water and dilute to 1 litre. One millilitre of this solution contains 1.0 mg of lead (as Pb).

A-3.3.5 Intermediate Lead Solution

A-3.3.6 Standard Lead Solution

Dilute 100 ml of intermediate lead solution to 1 litre with dilute nitric acid (1:499). One millilitre of this solution contains 0.1 mg of lead (as Pb).

A-3.4 Procedure

A-3.4.1 Sample Preparation

Tear the air dry sample into pieces of suitable size. Do not use cut or punched edges or other parts where metallic contamination may have occurred.

A-3.4.2 Preparation of Test Solution

Weigh to the nearest 0.01 g about 20 g of paper, leach the paper with about 200 ml of extraction fluid for 18 ± 2 h using shaker rotating/moving at 30 ± 2 rev/min. Filter the extract through glass fibre filter with 0.45 micron pore size.

A-3.4.3 Transfer the extract to a 250-ml conical flask. Add 5 ml concentrate nitric acid and a few boiling chips or glass beads. Slowly evaporate on a hot plate to about 10 to 20 ml. Continue heating and adding concentrated nitric acid until digestion is complete. Wash down with water and then filter if necessary. Quantitatively transfer filtrate to a 100-ml volumetric flask, dilute to the mark and mix thoroughly.

A-3.4.4 Inject a measured portion of the digested solution into the graphite oven. Dry, char and atomize according to the preset programme. Measure the absorbance.

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A-3.4.5 Prepare a reagent blank and sufficient standards containing 5.0, 7.5 and 10.0 mg/l of lead by diluting suitable volume of the standard lead solution with nitric acid (1:499) and repeat as above (A-3.4.3). Inject a suitable portion of each standard solution in order of increasing concentration. Analyse each standard solution and measure the absorbances.

A-3.4.6 Calculation

Construct a standard calibration graph by plotting the absorbance versus mg of lead concentration of each standard. Read the concentration of the sample from the graph and determine the lead content of the sample from the calibration graph using the following formula:

$$\text{Lead (as Pb), ppm} = \frac{C \times F \times 100}{M}$$

where

C = concentration of lead from the calibration curve;

F = dilution factor; and

M = mass of paper sample taken for testing, g.

A-4 DETERMINATION OF CADMIUM (as Cd)

A-4.1 Principle

The cadmium content of the sample is determined by electrothermal atomic absorption spectrometric method.

A-4.2 Apparatus

A-4.2.1 Atomic Absorption Spectrometer — with graphite oven technique in place of conventional burner assembly.

A-4.2.2 Cadmium Hollow-Cathode Lamp or Multielement Hollow-Cathode Lamp — For use at 228.8 nm.

A-4.2.3 Hot Plate

A-4.3 Reagents

A-4.3.1 Nitric Acid — Concentrated.

A-4.3.2 Nitric Acid — 1:1.

A-4.3.3 Dilute Nitric Acid — 1:499.

A-4.3.4 Stock Cadmium Solution

Dissolve 1.0 g of pure cadmium metal in minimum quantity of concentrated nitric acid and dilute to 1 litre with distilled water. One millilitre of this solution contains 1 mg of cadmium (as Cd).

A-4.3.5 Intermediate Cadmium Solution

Add 1 ml of concentrated nitric acid to 50 ml of stock solution and dilute to 1 litre with distilled water. One millilitre of this solution contains 50 µg of cadmium (as Cd)

A-4.3.6 Standard Cadmium Solution

To 10 ml of cadmium intermediate solution add 1 ml of concentrated nitric acid and dilute to 1 litre with distilled water. One millilitre of this solution contains 0.5 µg of cadmium (as Cd).

A-4.4 Procedure

A-4.4.1 Sample Preparation

Tear the air dry sample into pieces of suitable size. Do not use cut or punched edges or other parts where metallic contamination may have occurred.

A-4.4.2 Preparation of Test Solution

Weigh to the nearest 0.01 g about 20 g of paper, leach the paper with about 200 ml of extraction fluid for 18 ± 2 h using shaker rotating/moving at 30 ± 2 rev/min. Filter the extract through glass fibre filter with 0.45 micron pore size.

A-4.4.3 Transfer the extract to a 250-ml conical flask. Add 5 ml concentrate nitric acid and a few boiling chips or glass beads. Slowly evaporate on a hot plate to about 10 to 20 ml. Continue heating and adding concentrated nitric acid until digestion is complete. Wash down with distilled water and then filter if necessary. Quantitatively transfer filtrate to a 100-ml volumetric flask, dilute to the mark and mix thoroughly.

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A-4.4.4 Inject a measured portion of the digested solution into the graphite oven. Dry, char and atomize according to the preset programme. Measure the absorbance.

A-4.4.5 Prepare a reagent blank and sufficient standards containing 5.0, 7.5 and 10.0 mg/l of cadmium by diluting suitable volume of the standard cadmium solution with nitric acid (1:499). Inject a suitable portion of each standard solution in order of increasing concentration. Analyse each standard solution and measure the absorbances.

A-4.4.6 Calculation

Construct a standard calibration graph by plotting the absorbance versus mg of cadmium concentration of each standard. Read the concentration of the sample from the graph and determine the cadmium content of the sample from the calibration graph using the following formula:

$$\text{Cadmium (as Cd), ppm} = \frac{C \times F \times 100}{M}$$

where

C = concentration of cadmium from the calibration curve;

F = dilution factor; and

M = mass of paper sample taken for testing, g.

A-5 DETERMINATION OF PENTACHLOROPHENOL (PCP)

A-5.1 Principle

PCP is extracted with acetone by Soxhlet extraction. Acetone extract is evaporated to dryness and subjected to acetylation. The acetylated PCP is determined quantitatively by Gas Chromatograph- Electron Capture Detector (GC-ECD).

A-5.2 Apparatus

A-5.2.1 Round Bottom Flask — 250 ml.

A-5.2.2 Soxhlet Extractor

A-5.2.3 Water Bath

A-5.2.4 Separating Funnels — 60 ml and 100 ml.

A-5.2.5 Injection Syringes — 1 µl, 5 µl and 10 µl .

A-5.2.6 Gas Chromatograph with ECD — Capillary columns.

A-5.2.7 Glass Columns — Length 20 cm, internal diameter 12 mm filled with 5 cm of silica gel having particle size 63 µm × 200 µm.

A-5.3 Reagents

A-5.3.1 Acetone

A-5.3.2 n-Hexane

A-5.3.3 Acetic Anhydride

A-5.3.4 Sodium Sulphate Anhydrous

A-5.3.5 PCP Stock Solution

Dissolve 10 mg of pentachlorophenol in 100 ml of acetone. One millilitre of this solution contains 0.1 mg of pentachlorophenol.

A-5.3.6 PCP Standard Solution

Dilute 10 ml of stock solution with acetone to 100 ml. One millilitre of this solution contains 0.01 mg of pentachlorophenol.

A-5.3.7 Internal Standard Stock Solution

Dissolve 1 g of 2, 4 dibromophenol in 1l of acetone. One millilitre of this solution contains 1 mg of dibromophenol.

A-5.3.8 Internal Standard Solution

Dilute 1 ml of the stock solution (A-5.3.7) with acetone to 100 ml. One millilitre of this solution contains 10 µg of dibromophenol.

A-5.4 Procedure

A-5.4.1 Determine the moisture content of the sample as given in 9 of IS 1060 (Part 1) : 1966.

A-5.4.2 Weigh accurately about 1 g of the paper sample pieces up to two decimal places and put into a thimble. Extract with about 150 ml of acetone by

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Soxhlet extraction for 6 h. Filter the acetone extract, dry over anhydrous sodium sulphate, and evaporate under vacuum to a small volume approximately to 5 ml and cool.

A-5.4.3 Clean Up

Transfer the extract (A-5.4.2) to the silica gel packed column and elute with about 25 ml of *n*-hexane at the rate of 2 ml/min. Collect the eluent in a flask Dry over anhydrous sodium sulphate and evaporate nearly to dryness.

A-5.4.4 Treat the residue (A-5.4.3) with 1 ml of acetic anhydride, and heat on a water bath for about 30 min. Remove the flask from the water bath and cool the acetylated product. Transfer the content in a separating funnel and add 10 ml of hexane and 5 ml distilled water. Shake well for 2 minutes and let the layers be separated. Collect the hexane layer, dry over anhydrous sodium sulphate and evaporate nearly to dryness. Cool for at least 10 minutes, add 1 ml of internal standard solution and adjust the volume to 5.0 ml with *n*-hexane.

A-5.4.5 Inject 2 µl of the solution into the Gas Chromatograph. Record the peak size in area and peak height units. If peak response exceeds linear range of the system, dilute the concentration of the extract and reanalyze.

A-5.4.6 Calibration

Prepare three calibration standards from the PCP standard solutions. Add 1 ml of internal standard solution and follow the steps as above (A-5.4.3 to A-5.4.5). Tabulate peak height or area responses against calculated equivalent mass of underivatized pentachlorophenol injected. Prepare a calibration curve.

A-5.5 Calculation

Determine the PCP content of the sample from the calibration graph using the following formula:

$$\text{PCP content, mg/kg on dry matter} = \frac{A \times B \times V_i \times 100}{M \times C \times V_t \times (100 - X)}$$

where

A = PCP content in µg from the graph;

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- B = total volume of hexane extract before derivetization, ml;
 V_i = volume of eluent injected, ml;
 M = mass of the paper sample taken for testing, g;
 C = volume of hexane extract carried through derivatization, ml;
 V_t = volume of total eluent, ml; and
 X = moisture content, percent by mass.

A-6 DETERMINATION OF POLYCHLORINATED BIPHENYLS (PCBs)

A-6.1 Principle

PCB is extracted with boiling ethanolic potassium hydroxide solution. An aliquot of the extract is mixed with distilled water and subjected to extraction with hexane. The PCB content is determined quantitatively by GC-ECD by comparing the pattern of the peaks with the pattern of a suitable technical PCB.

A-6.2 Apparatus

A-6.2.1 *Erlenmeyer Flask* — 200 ml.

A-6.2.2 *Water Bath*

A-6.2.3 *Separating Funnels* — 60 ml and 100 ml.

A-6.2.4 *Injection Syringes* — 1 μ l, 5 μ l and 10 μ l.

A-6.2.5 *Gas Chromatograph with ECD* — Capillary columns.

A-6.2.6 *Glass Columns* — Length 20 cm, internal diameter 12 mm filled with 5 cm of silica gel having particle size 63 μ m $\times$ 200 μ m.

A-6.3 Reagents

A-6.3.1 *Ethanolic Potassium Hydroxide Solution*

Prepare 1 N ethanolic potassium hydroxide solution by dissolving the required amount of potassium hydroxide in absolute ethanol that has been purified as follows:

Dissolve 1.5 g of silver nitrate in 3 ml of water and add it to one litre of alcohol. Dissolve 3 g of potassium hydroxide in the smallest amount of hot distilled

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water, cool, and add it to the silver nitrate solution. Shake thoroughly, allow the solution to stand for at least 24 h, filter and distill.

NOTE — Absolute alcohol denatured with 10 percent by volume of methanol may also be used.

A-6.3.2 *n*-Hexane

A-6.3.3 Sodium Sulphate Anhydrous

A-6.3.4 PCB Stock Solution

Dissolve 10 mg of any PCB technical in 100 ml of hexane. One millilitre of this solution contains 0.1 mg of PCB.

A-6.3.5 PCB Standard Solution

Dilute 10 ml of stock solution with hexane to 100 ml. One millilitre of this solution contains 0.01 mg of PCB.

A-6.3.6 Internal Standard Stock Solution

Dissolve 1 g of 2, 4 dibromophenol in 1 l of *n*-hexane. One millilitre of this solution contains 1 mg of dibromophenol.

A-6.3.7 Internal Standard Solution

Dilute 1 ml of the stock solution (A-6.3.6) with hexane to 100 ml. One millilitre of this solution contains 10 µg of dibromophenol.

A-6.4 Procedure

A-6.4.1 Determine the moisture content of the sample as given in 9 of IS 1060 (Part 1) : 1966.

A-6.4.2 Weigh accurately about 1 g of the paper sample pieces up to two decimal places and take into a 200-ml Erlenmeyer flask. Add 50 ml of ethanolic potassium hydroxide solution and heat under reflux condenser for 4 h, filter and dilute to the mark with alcohol in a 250-ml volumetric flask. Take an aliquot portion of the test solution in a separating funnel, add sufficient distilled water and 15 ml hexane. Shake well for 5 minutes and wait for 15 minutes. Collect the hexane phase.

A-6.4.3 Filter the hexane extract. Dry the filtrate over anhydrous sodium sulphate, and evaporate under vacuum to approximately 5 ml. Take the residue for clean up.

A-6.4.4 Clean Up

Transfer the hexane extract (A-6.4.3) to the silica gel packed column and elute with about 25 ml of *n*-hexane at the rate of 2 ml/min. Collect the eluent in a flask and evaporate to a small volume. Add 1 ml of internal standard solution and made up to 10 ml with hexane.

A-6.4.5 Inject 2 μ l of the solution to the Gas chromatograph. From the peaks obtained PCB and Internal Standard are identified by their retention times as well as relative retention time.

A-6.4.6 Calibration

Prepare three calibration standards from the PCB standard solutions and follow the steps as above (A-6.4.3 to A-6.4.5). Tabulate peak height or area responses against calculated equivalent mass of underivatized pentachlorophenol injected. Prepare a calibration curve.

A-6.5 Calculation

Determine the PCB content of the sample from the calibration graph using the following formula:

$$\text{PCB content, mg/kg on dry matter} = \frac{A \times V_i \times 100}{M \times V_t \times (100 - X)}$$

where

- A = PCB content in μ g from the graph;
- V_i = volume of eluent injected, ml;
- M = mass of the paper sample taken in, g;
- V_t = volume of total eluent, ml; and
- X = moisture content, percent by mass.

(CHD 16)

Indian Standard

SPECIFICATION FOR FIBREBOARD BOXES

PART II SOLID FIBREBOARD BOXES

(First Revision)

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IS : 2771 (Part II) - 1975

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Indian Standard
**SPECIFICATION FOR
FIBREBOARD BOXES**

PART II SOLID FIBREBOARD BOXES

(First Revision)

0. FOREWORD

0.1 This Indian Standard (Part II) (First Revision) was adopted by the Indian Standards Institution on 5 April 1975, after the draft finalized by the Paper and Flexible Packaging Sectional Committee had been approved by the Marine, Cargo Movement and Packaging Division Council.

0.2 Originally IS : 2771-1965 covered only corrugated fibreboard boxes. While revising IS : 2771-1965, it was decided to cover both corrugated and solid fibreboard boxes in this standard. This revision is being issued in two parts, Part I covering corrugated fibreboard boxes and Part II solid fibreboard boxes.

0.3 In the wake of the search for cleaner and simpler materials for the fabrication of transport packages the solid fibreboard boxes have come to be used in large numbers. Solid fibreboard boxes are used to pack multiple of items differing widely in their shape, size, and mass. In addition to the functional features of solid fibreboard the other advantages include minimum storage space, low labour cost in preparation for use, etc.

0.3.1 Solid fibreboard boxes are suitable both as primary packages as well as transport packages for packaging a wide variety of commodities both for domestic consumption and for export.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part II) prescribes the requirements for solid fibreboard boxes for general packaging purposes, for weight up to 40 kg.

*Rules for rounding off numerical values (revised).

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1.2 This standard neither covers the requirements for waterproof/ weatherproof solid fibreboard boxes nor for the solid fibreboard boxes with fibreboard bodies and wood-frames/solid wood ends.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 4261-1967* and IS : 7186-1973† shall apply.

3. MATERIALS

3.0 The solid fibreboard boxes shall be manufactured from the following materials.

3.1 **Solid Fibreboard** — It shall comply with the requirements given in Table 1. In addition, it shall have good bending qualities [see 4.2 of IS : 2771 (Part I)-1975‡], good resistance to water absorption (see 7.1) and the outer face shall have good printability.

TABLE 1 REQUIREMENTS FOR SOLID FIBREBOARD BOXES

SL No.	WEIGHT OF CONTENTS, <i>Max</i>	COMBINED INTERNAL DIMENSIONS ($L+W+D$), <i>Max</i>	THICKNESS OF BOARD, <i>Min</i>	SUBSTANCE OF BOARD, <i>Min</i>	BURSTING STRENGTH OF BOARD, <i>Min</i>	PUNCTURE RESISTANCE OF BOARD, <i>Min</i>
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	kg	mm	mm	g/m ²	kg/cm ²	cm-kg
i)	10	1 000	1.10	800	8	39
ii)	20	1 500	1.80	1 350	14	63
iii)	30	2 000	2.25	1 700	18	90
iv)	40	2 250	2.50	1 950	21	102

3.2 **Joining Materials** — The joining materials shall be as prescribed in 3.2 of IS : 2771 (Part I)-1975‡.

4. MANUFACTURE

4.1 The boxes shall be manufactured as per the specification prescribed in 4 of IS : 2771 (Part I)-1975‡.

*Glossary of terms relating to paper and pulp based packaging materials.

†Glossary of terms relating to paper and flexible packaging.

‡Specification for fibreboard boxes: Part I Corrugated fibreboard boxes (first revision).

5. DIMENSIONS

5.1 The boxes shall conform to the dimensions as specified in 5 of IS : 2771 (Part I)-1975*.

6. PACKING AND MARKING

6.1 The boxes shall be packed and supplied as agreed to between the purchaser and the supplier.

6.2 Each box shall be legibly and indelibly marked on the outside with the following particulars:

- a) Gross weight limit,
- b) Minimum bursting strength,
- c) Dimensions ($L + W + D$),
- d) Batch or lot number, and
- e) Manufacturer's name or initials or recognized trade-mark.

6.2.1 Each box may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

7. TESTS

7.1 Waterproofness — When determined according to the method prescribed in 6 of IS : 4006 (Part I)-1966† the increase in weight of the board due to water absorption shall not exceed 155 g/m².

7.2 Thickness — The thickness of the board shall be determined by the method given in 7.2 of IS : 1060 (Part I)-1966‡.

7.3 Substance — The substance of the board shall be determined by the method given in 6.2 of IS : 1060 (Part I)-1966‡.

7.4 Bursting Strength — The bursting strength of the board shall be determined by the method given in 12.5 of IS : 1060 (Part I)-1966‡.

7.5 Puncture Resistance — The puncture resistance of the board shall be determined by the method given in 9 of IS : 4006 (Part II)-1972§.

*Specification for fibreboard boxes : Part I Corrugated fibreboard boxes (*first revision*).

†Methods of test for paper and pulp based packaging materials, Part I.

‡Methods of sampling and test for paper and allied products, Part I (*revised*).

§Methods of test for paper and pulp based packaging materials, Part II.

8. SAMPLING, CONDITIONING AND TESTING

8.1 The boxes shall be sampled and tested within 20 days of their receipt by the purchaser. From each consignment of 10 000 boxes or part thereof 20 boxes shall be selected for testing as follows:

- a) If the boxes are bundled 20 bundles shall be selected at random and from each bundle so selected one box shall be selected at random for testing.
- b) If the boxes are not bundled 20 boxes shall be selected at random from the total consignment.

8.2 Conditioning

8.2.1 The sample of 20 boxes so selected shall be deemed to represent the whole consignment of boxes and shall be conditioned for testing by the method prescribed in 5 of IS : 1060 (Part I)-1966*.

8.3 Testing

8.3.1 The types of tests and selection of boxes for testing shall be as indicated in Table 2.

8.3.1.1 The requirements for the material of construction of the box as well as method of test for evaluating these requirements shall be as given in relevant clauses and in Table 2.

TABLE 2 TESTING OF BOXES

SL No.	TYPE OF TEST	NO. OF BOXES SELECTED FROM SAMPLE FOR TESTING	NO. OF TEST SPECIMENS OBTAINED FROM EACH Box	NO. OF TESTS ON EACH TEST SPECIMEN	METHOD OF TEST, REF TO CLAUSE
(1)	(2)	(3)	(4)	(5)	(6)
i)	Bursting strength	3	1	10 (5 each side)	12.5 of IS : 1060 (Part I)-1966*
ii)	Water absorption cobb/30 Min	3	1	1 (on external surface only)	6 of IS : 4006 (Part I)-1966†
iii)	Thickness	3	2	3	7.2 of IS : 1060 (Part I)-1966*
iv)	Substance	3	1	1	6.2 of IS : 1060 (Part I)-1966*
v)	Puncture resistance	3	4 (2 each for CD & MD)	1	9 of IS : 4006 (Part II)-1972‡

*Methods of sampling and test for paper and allied products, Part I (revised).

†Methods of test for paper and pulp based packaging materials, Part I.

‡Methods of test for paper and pulp based packaging materials, Part II.

*Methods of sampling and test for paper and allied products, Part I (revised).

9. ACCEPTANCE AND RETESTING

9.1 Acceptance

9.1.1 The consignment of box shall be deemed to comply with the test requirements of the standard if after specified number of boxes from the test sample as given in Table 2 have been tested as required in relevant clause:

- a) All the boxes pass the test, or
- b) Only one box fails to pass one or more of the tests and on retesting in accordance with 9.2 no further box fails to pass the test or tests.

9.2 Retests

9.2.1 If only one box from the test sample fails to meet one or more of the test requirements of the specification further boxes shall be selected at random from the consignment of boxes for testing for the defective property or properties. The number of additional boxes to be tested shall be twice the number specified in Table 2 for the test or tests in which the box from the original test sample failed.

IS : 2771 (Part II) - 1975

(Continued from page 2)

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